planar target described for this invention appear to satisfy the conditions. Other magnetrons have been tested with planar targets, but no plasma waves are observed. Apparently, the electron mirror configuration of the complexly shaped target of Matsuoka et al. fails to launch the lower hybrid mode, and they fail to report any wave lower than about 100MHz. In view of our experience and the apparent phase velocity of the 22MHz mode, it seems necessary that a plasma mode be excited between 5 and 75MHz, preferably between 10 and 50MHz, in order to pump the 1 to 20eV plasma electrons. The launching of any plasma waves seems to depend upon a magnetic field projecting far away from the target. Matsuoka et al. accomplish this by a complex hollow cathode design. The present invention accomplishes this by the unbalanced magnetic field strengths of the two poles of the magnetron, which produces a vertical magnetic field far away from the target, as well as by driving the reactor at a high power level.

Replace the claims with:

6. (Amended) A method of sputtering a material from a target comprising a metal onto a working substrate supported on a pedestal in a system including a magnetron disposed on a side of said target opposite said pedestal and including an outer pole of one magnetic polarity and surrounding an inner pole of another magnetic polarity, wherein said outer pole extends from a enter of said target to a peripheral portion of said target and has an area smaller than a similarly extending circle, said method comprising:

rotating said magnetron about said center of said target to achieve full sputtering coverage of said target; and

capacitively coupling power into said chamber at least partially by applying DC power to said target but not including inductively coupling power into said chamber to thereby excite said working gas into a plasma to sputter said metal from said target onto said working substrate.

7. The method of Claim 6, wherein said metal comprises aluminum.

8. The method of Claim 6, wherein said metal comprises copper.

9. The method of Claim 6, wherein said metal comprises titanium.

~~10~~ 5. (Amended) The method of Claim ~~6~~ 1, wherein an integrated magnetic flux produced by said outer pole is at least 2.0 times an integrated magnetic flux produced by said inner pole.

11. (Twice Amended) An tungsten fill process, comprising the steps of:

39

placing a substrate containing a hole formed in a dielectric layer in a magnetron sputter reactor including a titanium target and a magnetron comprising an inner pole of a first magnetic polarity and producing a first total magnetic flux and an outer pole of an opposite second magnetic polarity, producing a second total magnetic flux at least 1.5 times said first magnetic flux, and surrounding said first magnetic pole;

in said magnetron sputter reactor, sputtering a barrier layer of titanium and titanium nitride into said hole while rotating said magnetron about a center of said titanium target; and

thereafter filling tungsten into said hole of said substrate.

12. (Amended) The process of Claim 11, further comprising an anneal of said substrate using radiant lamps and performed between said sputtering and filling steps.

13. The process of Claim 11, wherein there is no annealing step between said sputtering and filling steps.

14. The process of Claim 11, wherein said filling is performed by chemical vapor

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deposition.

15. The process of Claim 11, wherein said filling is performed by sputtering.

16. The process of Claim 11, further comprising rotating said magnetron about a back of said target.

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~~17. (New) The process of Claim 16, wherein said magnetron is asymmetric about an axis about which said magnetron is rotated.~~

6 ~~18~~. (New) The method of Claim 1 ~~6~~, wherein an amount of said DC power is no more than 18kW normalized to a circular reference substrate of 200mm diameter.

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~~19. (New) The method of Claim 6, wherein an amount of said DC power is sufficient to achieve an ionization density of said metal of at least 20%.~~

8 ~~20~~. (New) The method of Claim 1 ~~6~~, wherein said metal is a barrier metal.

14 ~~21~~. (New) A method of sputtering a material from a target comprising a metal onto a working substrate supported on a pedestal in a system including a magnetron disposed on a side of said target opposite said pedestal and including an outer pole of one magnetic polarity and surrounding an inner pole of another magnetic polarity and being asymmetric about a center of said target, said method comprising:

rotating said magnetron about said center of said target to achieve full sputtering coverage of said target; and

capacitively coupling power into said chamber at least partially by applying DC power to said target and exciting said working gas into a plasma to sputter said metal from

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said target onto said working substrate .

~~22~~ 15. (New) The method of Claim ~~21~~ 14, wherein said magnetron has a generally triangular shape with an apex closer said center of said target than to a periphery thereof.

~~23~~ 16. (New) The method of Claim ~~21~~ 14, wherein an amount of DC power applied to said target is sufficient to achieve an ionization density of at least 20%.

~~24~~ 17. (New) The method of Claim ~~23~~ 16, wherein said metal is a barrier metal.

~~25~~ 18. (New) The method of Claim ~~21~~ 14, wherein said metal is a barrier metal.

~~26~~ 19. (New) The method of Claim ~~21~~ 14, wherein said working gas is excited into said plasma without inductively coupling power into said chamber.

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